



INDIANA OFFICE OF ENERGY AND DEFENSE DEVELOPMENT



Advanced Military Informatics Business Plan

November 2007

ADVANCED MILITARY INFORMATICS HIGH LEVEL BUSINESS PLAN

Advanced Military Informatics is the use of algorithms based on advancements in mathematical sciences in studies, analytical software tools, and devices to improve real world information gathering and synthesis that leads to improved decisions in conducting intelligence operations in the military, the intelligence community, homeland defense, and national studies. These algorithms may be used across multiple function including research, training, planning, and critical mission operations. Civilian use is anticipated in areas such as law enforcement, geographical information systems, and automated systems. This focus area derives wealth from a growth area in the target customer set based on a unique set of knowledge and tradecraft found in Indiana. The opportunity exists for Indiana to uniquely fill a white space in the countries' military, aerospace, and homeland security missions. The underlying technology created in this focus area (grid computing, handheld supercomputers, mixed reality) has application across all business and governmental sectors of the economy.

DETAILED DESCRIPTION:

It is the goal of Advanced Military Informatics to enable the conversion from data to interpretation to response in near real time. For the warfighter, this is called 'sensor to shooter' and there are equivalencies for other roles such as the first responder, border patrol (land and sea), operations planning, covert intelligence operations, and autonomous vehicles.

This focus area addresses the staff/skill shortage these customers are facing in weeding through the tidal wave of data being created by today's civilian and military systems. At the same time, the adversaries are getting more devious in their ability to hide the data needed for effective intelligence operations.

In the DOD document, Joint Vision says that the U.S. military doctrine is to dominate with information. The guide for this area is that "More knowledge is not power, it is debilitating. Informatics is how this problem is overcome." The key to protecting the country and its allies is to be preemptive and not have to respond. This can only be done through Informatics.

This target involves information technology in the areas of computation (combinatorial math, topology, signal processing, and pattern recognition), knowledge management (data mining, data fusion, real time operating systems, information sciences, image recognition and search, moving object tracking, collision avoidance, and linguistics), human understanding (visualization, mixed reality, and serious games), Information Security from both offensive and defensive sides (e.g., identity management, encryption, information assurance), and simulation/modeling (network analysis such as swarm theory, system dynamics, control systems, and complex systems). Independent Verification & Validation skills and processes for Software is crucial to this focus area as the applications this technology will be applied to are both complex and mission critical.

Knowledge assets needed in this focus area are: Mathematical Sciences, Informatics, Advanced Computer Architecture, Software Independent Verification and Validation (IV & V), Grid Computing, Sensor based systems, Database Systems, Modeling /Simulation, Control Systems, Complex Systems Theory, Cognitive Science, Decision Theory, Visualization, and Information Security. Advanced Information Security capabilities are essential in this area to guard against the powerful capabilities and information generated by this advanced technology. Information Security disciplines such as Identity Management, Biometrics, Secure Software, Federated Databases, and Encryption are involved.

IMPORTANCE FOR INDIANA TO FOCUS AND COLLABORATE ON ADVANCED MILITARY INFORMATICS

The state can capture a competitive position by focusing on this area. Except for groups in the Washington D.C. area, there are few parts of the country capable of moving concept to product. Much of the available funding is kept in black budgets, so few have insight into the potential. Problems of the nation can only be solved with informatics to investigate, digest, improve, and act quickly on the vast amounts of data being created in the civilian world and in combat that has been enabled by digital technology.

The presence of prime contractors in the state who are involved in this area will be helpful in getting Indiana's advanced military informatics products and services into use by the military, aerospace, and homeland security.

Table 28 below indicates the extent of the Military Informatics assets in Indiana that can address military, aerospace, and homeland security opportunities. These assets are very strong and range from academic institutions clustered around IU Medical School, Purdue, IUPUI, and Notre Dame to large companies, especially in pharmaceuticals, orthopedics, and hospitals, as well as major research centers and a range of small companies involved in chemical and biological sensing, neurological treatment devices, and drug manufacturing equipment.

This focus area can augment the Muscatatuck Urban Warfare Center by providing units being trained on the ground intelligence capabilities. When those units return to their posts, they will be ready, willing, and able to use those advanced military informatics techniques and devices they used in their exercise.

Table 1

INDIANA ASSETS

University		<u>Large Companies</u>	<u>Small Companies</u>	<u>Other</u>
IU Center for Applied Cybersecurity Research	PU Rosen Center for Advanced Computing	Rolls Royce	Arxan Technologies	Internet 2 Network Operations Center
IU Computer Interaction Design Center	PU Center for Education and Research in Information Assurance and Security (CERIAS)	Raytheon	InfoComm	Complementary Data Mining Skills in Life Sciences at IU, PU, IUPUI and Regenstein Institute
IU Computational Linguistics	PU Homeland Security Institute	ITT Space Systems	Stanley Security Solutions	Indiana Intelligence Fusion Center
IU Cognitive Science Department (Top 10 ranking)	PU Envision Center for Data Perceptualization	ITT Aerospace Communications	Trust Peener Labs	Wright Patterson AFB in Dayton
IU School of Informatics	PU Indiana Center for Database Systems	General Dynamics	Information-In-Place	Crane as a source for applications
IU Data and Search Institute	PU Holographic Imaging Project	Northrup Grumman Electronics	Simulex	Northwest Indiana Computational Grid
IU Distributed Sensor Network trial	PU Regional visual Analytical Center		MNB Technologies	Indiana Innovation Network
IU Pervasive Technology Labs			Advanced Process Combinatorics	
IU Advanced Network Management Lab	Notre Dame Center for Complex Network Research (CCNR)		Megaputer	
IU Community Grids Lab	Notre Dame Top 20 in Mathematical Topology		Pricise Path Robotics	
IU Knowledge Acquisition and Projection Lab	Notre Dame Amorphous Computing Project		Lite Machines	
IU Open Systems Lab	ISU Institute of Cognitive Computing Technology Lab		Humanizing Technologies	
IU Scientific Data Analysis Lab	IPFW Institute for Decision Science and Theory		Sim2K	
IU Visualization and Interactive Spaces Lab	Ball State Software Engineering Research		Wolf Technical Services	

	Center		Savitar ChaCha Zoom Information Systems American Aviation PC Krause and Associates	
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There is a foundation for immediate action as the following initiatives have been identified by the Hoosiers already involved in this focus area:

- Advanced Military Informatics Opportunities list based on 50 Top Indiana Brains
- Advanced Military Informatics Vision 2012 – a strategic long-term vision for leveraging Indiana’s Informatics capabilities into opportunities
- Sensors to Information Analysis Challenge – a state-wide or nation-wide “DARPA-like” challenge for best development & utilization of sensor data to usable, analyzed information
- Statewide Informatics/Knowledge Management Higher Education Curriculum
- Mixed Reality Competency Center, Challenge – a “DARPA-like” challenge and/or a center of excellence for showcasing visioning, heads-up display, simulation and other mixed reality technologies and applications.

There is also a crosscut of this focus group with the Defense Electronics and Services and Support focus areas.

PROPOSED TEAM ACTION PLAN

IN YEAR ONE:

1. Convene Indiana’s Top 50 Brains in Advanced Military Informatics doing a show and tell with each other. Output: Indiana Advanced Military Informatics Capabilities/Inventory list and beginnings of a glossary of standardized terms
2. Create a Community of Interest.
3. Make sure architects can transform the Capability/Inventory list into an opportunities list.
4. Communicate to university presidents that this needs to be a clear discipline area.
5. Build a picture of what Indiana is like in 5 years including such visions as students coming to Indiana universities for this area and companies coming to Indiana to set up shop, new startups.
6. Start a Sensor to Information Analysis challenge. This has as high payoff. It must stress collaboration.
7. Brief this focus area to Indiana’s Congressional delegation so that they keep an eye open for opportunities.
8. Choose a leader who would then lead the group in producing a plan.
9. *Win 2 contracts.*

There is a dependency on entities outside this team to perform the following activities to meet this plan: a state marketing plan and a briefing on this report with the new university presidents and Ivy Tech’s new chancellor. The team expects that it will participate in the planning and support for these activities.

IN YEAR TWO:

1. Identify applications of the Capabilities/Inventory List by getting Contract Manager surrogates within Indiana, such as prime contractors.
2. Review (or test run) of the Advanced Military Informatics target actions in Year 1 to spot needed changes and new initiatives.

3. Two academic programs in Advanced Military Informatics. Need to be creative in fitting Military Informatics into existing University programs.
4. Informatics/Knowledge Management degree programs at multiple campuses - consistent across campuses
5. Place students in jobs that are in this focus area to show other students that this is a good career path.
6. Obtain further funding for initiatives and infrastructure.
7. Enhance the Informatics Challenges.

There is a dependency on entities outside this team to perform the following activities to meet this plan: continual enhancement of a database for locating potential partners and a situation alert system. The team expects that it will participate in the planning and support for these activities.

IN FOLLOWING YEARS

1. Statewide initiative for Informatics/Knowledge Management degree programs
2. Four campuses that have instituted the above degree programs.

RECOMMENDED STAKEHOLDER ACTIONS

This focus area will depend on specific actions on the part of stakeholders within the state.

PUBLIC/PRIVATE DEFENSE ASSETS CONSORTIUM

- Facilitate better collaboration (meetings) between commercial companies, between universities, and Federal and State legislators to build relationships, catalyze efforts to address specific initiatives/contract opportunities, and discuss issues.
- Organize a standard tour for DOD and Homeland Security program managers and science officers to make them knowledgeable of Indiana's AMI assets.
- Create a virtual tour for DOD and Homeland Security program managers and science officers to make them knowledgeable of Indiana's AMI assets.
- Create and manage a program for marketing Indiana as a defense technologies state.
- Enable small companies and academic technology transfer organizations to reach out to large companies for commercialization assistance.
- Work with the DOD Mentor-Protégé Program or set up a statewide program to mimic it to create relationships between companies already working with DOD and Homeland Security and those seeking to do so.
- Scan for and communicate BAA's and SBIR's that apply to this focus area as well as provide information on prime contractors who are interested in responding to them.
- Tap Wright Patterson AFB for opportunities, they have a lot of SBIRs and BAAs of interest (for example, in HyperSpectral Intelligence).
- Provide a clearinghouse to shop Indiana SBIR's leaving Phase 2 to Indiana Prime Contractors and to outside the State.
- Correlate SBIRs/STTRs to BAAs to enhance commercialization opportunities and find new sources of funds for functionally extending a military informatics technology.
- Sponsor an informatics based challenge that allows technology to be wedded, for example, creating a serious game for Urban Warfare or Border Patrol or Force Protection.

STATE GOVERNMENT

- Enhance the statewide database of available state assets. A use consistent, universal definition so that assets aren't lost as is common in a novel area like this one.
- Staff an advocate in Washington D.C. to help find opportunities in military informatics within DOD and Homeland Security and to promote Indiana generated proposals in this focus area.
- Be a customer for Informatics prototypes and solutions.

INDUSTRY

- Prime contractors pay subcontractors to do work through small business set asides.
- Be proactive with academia in driving the underlying curricula for this focus area such as computational science, knowledge management, and cognitive sciences.
- Promote military informatics as a distinctive field of endeavor.
- Create a risk mitigation system for customers who might be concerned about working with a small AMI company because it is not as permanent nor reliable as a major prime contractor providing the same technology

ACADEMIA

- An academic skills and projects database that uses consistent, universal definitions
- Institute academic degree programs in military informatics and do it on a fast track basis
- Conduct conferences and symposia in this focus area.
- Take a leadership role in spawning startups.
- Staff proposal review committees at DARPA, Science Boards of the armed services, training commands, etc.
- Improve the technology transfer process to release more technology for commercialization by commercial state assets without endangering the latter's competitiveness.

IMPLEMENTATION PLAN

ORGANIZATION AND SUSTAINABILITY

For ultimate success, this focus area must have some initial wins to show that collaboration is effective and to attract other companies, especially SMEs not yet doing business with the military and homeland security, into the effort of gaining money from these customers. This means that the organizational structure has to avoid the heavy handed processes of the past in proceed in a self-organizing network manner.

Gaps in assets have been identified that must be resolved by either internal (to the state) development, finding out of state partners, or attraction into the state for: IV&V, human factors, and modeling of scalability of an algorithm. In addition, new infrastructure is needed in areas of a roadmap, training support personnel, new legal practices, and creating the net of relationships in such a new and ever-changing white space.

This focus area needs to become critical mass in two years to stay ahead and ultimately sustain.

METRICS

The following parameters are recommended as a source for three to seven vital performance measures:

- Dollars per number of contracts with key sponsors
- Number of patents, publications, and symposiums

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- SMEs tapped by Federal Agencies as experts
 - Number of universities with degree programs and # students graduating
 - Number of new collaborations each year between industry and academia and also large and small companies
 - Number of patents or other IP measure within Indiana in the area of informatics across academia and industry
 - Number of Informatics related jobs in the state as a function of time
 - Number of general publications to get academics
 - Number students placed
 - Enrollment in military informatics and allied curricula
 - Diversity of companies, locations, customers

SUMMARY

Of all the focus areas identified in the Defense Assets Study, advanced military informatics has the greatest opportunity to exploit the intellectual assets of the state's universities. With an effective process for transferring Intellectual Property to commercial products and services, this potential can be realized. The best way for this to happen is to work in collaboration to provide complete solutions and assure that the supporting processes are implemented correctly. To be successful, the Advanced Military Informatics focus action team must achieve the following objectives:

1. Access to a central "consortium" that can manage marketing, the high level customer relationships, centralized infrastructure, a reputation for success, high level state relationships, and growth/renewal.
2. Active, ongoing programs to recruit, involve, and assist inexperienced SMEs in obtaining Military Informatics business
3. An improved process for getting IP out of Indiana Universities so that it can be commercialized
4. A partnership of all the players with a strong teaming attitude and knowledgeable leaders acting as catalysts not overlords
5. Attracting, retaining, and upgrading military informatics knowledge and tradecraft